**Conceptualizing Dividing Whole Numbers by Fractions**

Objective: Students begin to conceptualize the division of fractions by developing visual representations of the division of whole numbers by fractions.

In this first lesson students will look at the division of whole number and fractions which are divided by smaller or equal the first fractions which produce whole number answers. They will learn to view division of whole numbers by fractions by asking how many \_\_\_ are in \_\_\_\_.

Materials:

Pattern Blocks or Virtual Pattern Blocks

National Library of Virtual Manipulative – Geometry – Pattern Blocks

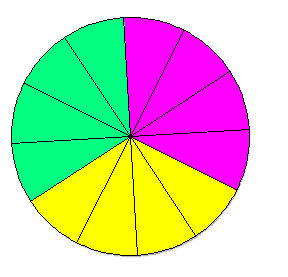
<http://nlvm.usu.edu/en/nav/frames_asid_170_g_2_t_3.html?open=activities&from=category_g_2_t_3.html>

Lesson:

When teaching a conceptual understanding of dividing fractions it is helpful if students understand that there are two ways of thinking of a divide problem.

* Dividing the whole into groups (This is the concept typically taught when introducing division). Example – To solve 6 ÷ 3 you would divide 6 into three equal groups. Story problem example Your pizza is cut into 12 slices. If you and three friends evenly divide the pizza how many pieces will each person get.

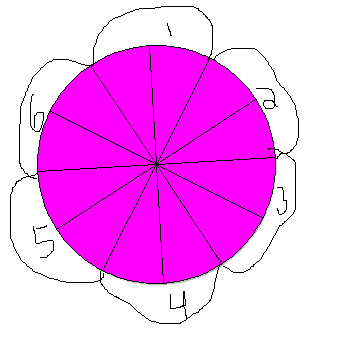
Student Representation of a pizza divided into three groups



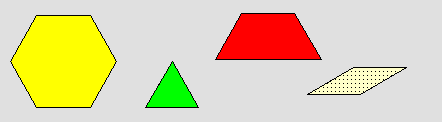
* Finding how many groups are in a whole. To solve 6 divided by 3 you would see how many groups of three you can take out of 6. (How many \_\_\_ are in \_\_\_?)

Story problem example- Your pizza is cut into 12 slices. You want to invite some friends over and give each person 2 slices. How many friends can you invite? (How many 2’s are in 12?)

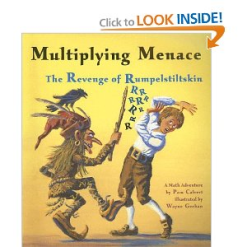
Student Representation of finding how many groups of two are in 1 pizza.



* It is important that the students are comfortable with the second perspective of division in learning to conceptualize the division of fractions. (eg. 2 ½ ÷ ½ can be easily conceptualized by think how many ½ ‘s are in 2 ½ ?). Have the students answer enough story problems that they are comfortable in thinking of division in this manner. Be sure to connect each problem with the symbolic equation
* Using the pattern blocks, have the students start with a yellow hexagon, green triangle, red trapezoid, blue parallelogram (colors may vary with different pattern block sets). Tell the students to think of the hexagon as the 1 unit and ask the students to determine the fractional size of the other shapes. (triangle – 1/6, trapezoid- ½, parallelogram – 1/3). As the answers are discussed write the symbolic equations on the board.



* Write 1 ÷1/6 = Guide the students in a discussion showing 1 ÷ 1/6 (How many triangles in the hexagon) is 6. Have the students repeat for the trapezoid, and the parallelogram. As they do so have the students write the symbolic sentence.
* Extra Activity (If the students are showing that they have developed a good understanding of a whole number divided by a fraction and there is enough time extend their thinking by introducing questions of dividing a fraction by a fraction - Have the students put out a trapezoid and determine how many 1/6 will fit on it (1/2 ÷1/6 = 3). Assign them to come up with 10 number sentences describing relationships among the blocks. Expand their thinking to include items such as 2/3 ÷1/6 or 2 1/2÷ ½
* Discuss with the students patterns they observe ( Help them to see that when you divide a whole by a fraction, the answer will be bigger than original number. If available read to the students the children’s book Multiplying Menance: The Revenge of Rumpelstilskin by Pam Calvert. In this book, Rumpelstilskin takes over the kingdom by multiplying objects with his magical multiplication staff. The hero of the story undoes the damage done by using the multiplication staff with fractions.

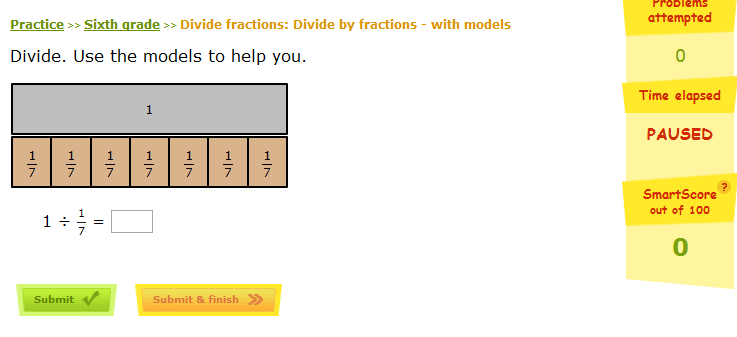


* Story problems – have the students perform the problems using the virtual manipulative and write the symbolic number sentences as they solve the following situations. Topics in which we frequently use fractions are:
  + Time e.g. How many ½ hours are there in 2 hours?
  + Money e.g. How many quarters (1/4) are in ¾ of a dollar?
  + Sewing/Crafts e. g. How many ½ inch ribbons could I cut from a foot of material
  + Construction e.g. If I have an 8 foot board, how many sections could I cut it into if each sections is 1/3 of a foot?
  + Cooking e.g. How many 1/3 cups of flour can I get if I have 5 cups total?

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* Practice-Have students practice the division of a whole number by fractions by answer questions at the ixl web site.

<http://www.ixl.com/math/practice/grade-6-divide-by-fractions-with-models>



Assessment - Have the students illustrate their solution to the following problem.

* 3 ÷ ½ =
* 2 ÷1/4 =
* 4 ÷ 1/8=
* 2 ÷ 1/16 =